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Journal of the Society of Arts.

FRIDAY, OCTOBER 29, 1858.

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MEETING OF COUNCIL.

At a Meeting of the Council, held on Wednesday last, the following Institutions were received into Union :—

Bristol, Young Men's Christian Association and Literary Institute.
Willenhall, Reading and Literary Society.

PHOTOGLYPHIC ENGRAVING.

The following is a description of Mr. Fox Talbot's new discovery of a means by which a photograph may be transferred direct to copper or steel plate, taken from the specification of the patent which has just been enrolled:—

" In this invention I employ plates of steel, copper, or zinc, such as are commonly used by engravers. Before using a plate its surface should be well cleaned; it should then be rubbed with a linen cloth, dipped in a mixture of caustic, soda, and whiting, in order to remove any remaining trace of greasiness. The plate is then to be rubbed dry with another linen cloth. This process is then to be repeated; after which the plate is in general sufficiently clean.

" In order to engrave a plate I first cover it with a substance which is sensitive to light. This is prepared as follows:—About a quarter of an ounce of gelatine is dissolved in eight or ten ounces of water, by the aid of heat. To this solution is added about one ounce, by measure, of a saturated solution of bichromate of potash in water, and the mixture is strained through a linen cloth. The best sort of gelatine for the purpose is that used by cooks and confectioners, and commonly sold under the name of gelatine. In default of this, isinglass may be used, but it does not answer so well. Some specimens of isinglass have an acidity, which slightly corrodes and injures the metal plates. If this accident occurs, ammonia should be added to the mixture, which will be found to correct it. This mixture of gelatine and bichromate of potash keeps good for several months, owing to the antiseptic and preserving power of the bichromate. It remains liquid and ready for use at any time during the summer months; but in cold weather it becomes a jelly, and has to be warmed before using it; it should be kept in a cupboard or dark place. The proportions given above are convenient, but they may be considerably varied without injuring the result. The engraving process should be carried on in a partially darkened room, and is performed as follows:—A little of this prepared gelatine is poured on the plate to be engraved, which is then held vertical, and the superfluous liquid allowed to drain off at one of the corners of the plate. It is held in a horizontal position over a spirit lamp, which soon dries the gelatine, which is left as a thin film, of a pale yellow colour, covering the metallic surface, and generally bordered with several narrow bands of prismatic colours. These colours are of use to the operator by enabling him to judge of the thinness of the film; when it is very thin, the prismatic colours are seen over the whole surface of the plate. Such plates often make excellent engravings; nevertheless, it is perhaps safer to use gelatine films which are a little thicker. Experience alone can guide the operator to the best result. The object to be engraved is then laid on the metal plate, and screwed down upon it in a photographic copying frame. Such objects may be either material substances, as lace, the leaves of plants, &c., or they may be engravings, or writings, or photographs, &c. The plate, bearing the object upon it, is then to be placed in the sunshine, for a space of time varying from one to several minutes, according to circumstances; or else it may be placed in common daylight, but of course for a long time. As in other photographic processes, the judgment of the operator is here called into play, and his experience guides him as to the proper time of exposure to the light. When the frame is withdrawn from the light, and the object removed from the plate, a faint image is seen upon it—the yellow colour of the gelatine having turned brown wherever the light has acted. This process, so far as I have yet described it, is, in all essential respects, identical with that which I described in the specification of my former patent for improvements in engraving, bearing date the 29th October, 1852.

" The novelty of the present invention consists in the improved method by which the photographic image, obtained in the manner above described, is engraved upon the metal plate. The first of these improvements is as follows:—I formerly supposed that it was necessary to wash the plate bearing the photographic image in water, or in a mixture of water and alcohol, which dissolves only those portions of the gelatine on which the light has not acted; and I believe that all other persons who have employed this method of engraving, by means of gelatine and bichromate of potash, have followed the same method, viz., that of washing the photographic image. But however carefully this process is conducted, it is frequently found, when the plate is again dry, that a slight disturbance of the image has occurred, which, of course, is injurious to the beauty of the result; and I have now ascertained that it is not at all necessary to wash the photographic image; on the contrary, much more beautiful engravings are obtained upon plates that have not been washed, because the more delicate lines and details of the picture have not been at all disturbed. The process which I now employ is as follows:—When the plate bearing the photographic image is removed from the copying-frame, I spread over its surface, carefully and very evenly, a little finely-powdered gum-copal (in default of which common resin may be employed). It is much easier to spread this resinous powder evenly upon the surface of the gelatine than it is to do so upon the naked surface of a metal plate. The chief error the operator has to guard against is that of putting on too much of the powder; the best results are obtained by using a very thin layer of it, provided it is uniformly distributed. If too much of the powder is laid on, it impedes the action of the etching liquid. When the plate has been thus very thinly powdered with copal, it is held horizontally over a spirit-lamp, in order to melt the copal; this requires a considerable heat. It might be supposed that this heating of the plate, after the formation of a delicate photographic image upon it, would disturb and injure that image, but it has no such effect. The melting of the copal is known by the change of colour. The plate should then be withdrawn from the lamp, and suffered to cool. This process may be called the laying of an aquatint ground upon the gelatine, and I believe it to be a new process. In the common mode of laying an aquatint ground, the resinous particles are laid upon the naked surface of the metal, before the engraving is commenced. The gelatine being thus covered with a layer of copal, disseminated uniformly and in minute particles, the etching liquid is to be poured on. This is prepared as follows:—Muriatic acid, otherwise called hydrochloric acid, is saturated with peroxide of iron, as much as it will dissolve with the aid of heat. After straining the solution, to remove impurities, it is evaporated till it is considerably reduced in volume, and is then poured off into bottles of a convenient capacity; as it cools it solidifies into a brown semi-crystalline mass. The bottles are then well corked up, and kept for use. I shall call this preparation of iron by the name of perchloride of iron, in the present specification, as I believe it to be identical with the substance described by chemical authors under that name, for example, see 'Turner's Chemistry,' fifth edition, page 537; and by others called permuriate of iron; for example, see 'Brande's Manual of Chemistry,' second edition, vol. ii., page 117.

"It is a substance very attractive of moisture. When a little of it is taken from a bottle, in the form of a dry powder, and laid upon a plate, it quickly deliquesces, absorbing the atmospheric moisture. In solution in water, it forms a yellow liquid in small thicknesses, but chestnut-brown in greater thicknesses. In order to render its mode of action in photoglyphic engraving more intelligible, I will first state that it can be usefully employed in common etching; that is to say, that if a plate of copper, steel, or zinc is covered with an etching-ground, and lines are traced on it with a needle's point, so as to form any artistic subject, then, if the solution of perchloride of iron is poured on, it quickly effects an etching, and does this without disengaging bubbles of gas or causing any smell; for which reason it is much more convenient to use than aquafortis, and also because it does not injure the operator's hands or his clothes if spilt upon them. It may be employed of various strengths for common etching, but requires peculiar management for photoglyphic engraving; and, as the success of that mode of engraving chiefly turns upon this point, it should be well attended to.

"Water dissolves an extraordinary quantity of perchloride of iron, sometimes evolving much heat in the solution. I find that the following is a convenient way of proceeding:—

"A bottle (No. 1) is filled with a saturated solution of perchloride of iron in water.

"A bottle (No. 2) with a mixture, consisting of five or six parts of the saturated solution and one part of water.

"And a bottle (No. 3) with a weaker liquid, consisting of equal parts of water and the saturated solution. Before attempting an engraving of importance, it is almost essential to make preliminary trials, in order to ascertain that these liquids are of the proper strengths. These trials I shall therefore now proceed to point out. I have already explained how the photographic image is made on the surface of the gelatine, and covered with a thin layer of powdered copal or resin, which is then melted by holding the plate over a lamp. When the plate has become perfectly cold, it is ready for the etching process, which is performed as follows:—A quantity of the solution in bottle No. 2, viz., that consisting of five or six parts of saturated solution to one of water, is poured upon the plate, and spread with a camel-hair brush evenly all over it. It is not necessary to make a wall of wax round the plate, because the quantity of liquid employed is so small that it has no tendency to run off the plate. The liquid penetrates the gelatine wherever the light has not acted on it, but it refuses to penetrate those parts upon which the light has sufficiently acted. It is upon this remarkable fact that the art of photoglyphic engraving is mainly founded. In about a minute the etching is seen to begin, which is known by the parts etched turning dark brown or black, and then it spreads over the whole plate—the details of the picture appearing with great rapidity in every quarter of it. It is not desirable that this rapidity should be too great, for, in that case, it is necessary to stop the process before the etching has acquired sufficient depth (which requires an action of some minutes' duration). If, therefore, the etching, on trial, is found to proceed too rapidly, the strength of the liquid in bottle No. 2 must be altered (by adding some of the saturated solution to it) before it is employed for another engraving; but if, on the contrary, the etching fails to occur after the lapse of some minutes, or if it begins, but proceeds too slowly, this is a sign that the liquid in bottle No. 2 is too strong, and too nearly approaching saturation. To correct this, a little water must be added to it before it is employed for another engraving. But, in doing this, the operator must take notice, that a very minute quantity of water added often makes a great difference, and causes the liquid to etch very rapidly. He will therefore be careful, in adding water, not to do so too freely. When the proper strength of the solution in bottle No. 2 has thus been adjusted, which generally requires three or four experimental trials, it can be employed with security. Supposing, then, that it has been ascertained to be of the right strength, the etching is commenced as above mentioned, and proceeds till all the details of the picture have become visible, and present a satisfactory appearance to the eye of the operator, which generally occurs in two or three minutes, the operator stirring the liquid all the time with a camel-hair brush, and thus slightly rubbing the surface of the gelatine, which has a good effect. When it seems likely that the etching will improve no further it must be stopped. This is done by wiping off the liquid with cotton wool and then rapidly pouring a stream of cold water over the plate, which carries off all the remainder of it. The plate is then wiped with a clean linen cloth, and then rubbed with soft whiting and water to remove the gelatine. The etching is then found to be completed.

"I will now describe another etching process, very slightly differing from the former, which I often use. When the plate is ready for etching, pour upon it a small quantity of the liquid (No. 1—the saturated solution.) This should be allowed to rest upon the plate one or two minutes. It has no very apparent effect, but it acts usefully in hardening the gelatine. It is then poured off from the plate, and a sufficient quantity of solution (No. 2) is poured on. This effects the etching in the manner before described, and, if this appears to be quite satisfactory, nothing further is required to be done. But it often happens that certain faint portions of the engraving, such as distant mountains or buildings in a landscape, refuse to appear; and as the engraving would be imperfect without them, I recommend the operator, in that case, to take some of the weak liquid (No. 3) in a little saucer, and without pouring off the liquid (No. 2) which is etching the picture, to touch with a camel hair-brush, dipped in liquid No. 3, those points of the picture where he wishes for an increased effect. This simple process often causes the wished for details to appear, and that, sometimes, with great rapidity, so that caution is required in the operator, in using this weak solution (No. 3) especially, lest the etching liquid should penetrate to the parts which ought to remain white; but, in skilful hands, its employment cannot fail to be advantageous, for it brings out soft and faint shadings, which improve the engraving, and which would otherwise probably be lost. Experience is requisite in this, as in most other delicate operations connected with photography, but I have endeavoured clearly to explain the leading principles of this new process of engraving, according to the method I have hitherto found the most successful."

BRITISH ASSOCIATION, LEEDS, 1858.

Reaping Machinery.

The following paper was read before the Mechanical Section by Alfred Crosskill:—

The paper on Reaping Machinery which I read before the Mechanical Section in the year 1853, at the meeting of the British Association in Hull, contained a general history of all the early inventions for reaping on record, none of which excited any interest, or were generally known to the public, prior to the Great Exhibition of 1851, when the introduction there of two reaping machines from America drew general attention to the subject. Mr. Garrett, Messrs. Ransomes (of Ipswich), Mr. Samuelson, and the father of the writer (Mr. William

Croskill) immediately took a prominent part in introducing reaping machinery into the harvest-fields of this country; and Mr. Croskill succeeded in bringing into general notice, and subsequently into practical operation, a reaper which had been in existence in Scotland, and worked there by its owner, for nearly twenty years, but which, for want of practical knowledge in perfecting its mechanical construction, had scarcely been heard of during that time beyond the limits of the district in which it was originally put together.

The two American reapers, known respectively as Hussey's and M'Cormick's, and the Scotch machine, called "Bell's," after its originator, who was a minister in Fifeshire, were in 1853 the only implements capable of doing any practical work in the harvest-fields; and though they have during the succeeding five years been greatly improved, modified, and re-constructed as experience has shown to be necessary to meet the varied requirements of English agriculture, they still retain their distinctive peculiarities sufficiently to divide reaping machines into three separate classes or varieties, and all the schemes and novelties which have been brought forward since the year 1852 have either failed and been laid aside, or have resolved themselves into variations of one of the three machines first established.

Before describing the fundamental differences in the construction of these three reapers, and briefly indicating the important improvements that have been made in them since their introduction, it is desirable briefly to point out the work which has to be accomplished by an efficient machine for reaping. Most inventors or mechanics who for the first time turn their attention to this subject occupy themselves almost exclusively with the cutting apparatus, apparently overlooking that the convenient disposal or delivery of the cut corn is a very important part of the functions of reaping machines, and has, in fact, been the real difficulty in bringing them into practical use. The cutting parts of all the reapers have for a length of time been sufficiently perfect to encounter successfully every crop that they can reasonably be required to cut; but to obtain an efficient means of delivery has taxed to the utmost the patience, perseverance, and ingenuity of all who have been engaged with the subject, and considerable difficulty has been experienced in perfecting an arrangement that will satisfactorily deliver all descriptions of grain.

The only efficient cutting apparatus hitherto brought into practical use consists of a series of V-shaped knives fixed side by side on a light moveable bar, extending across the whole width of the front part of the reapers, and connected, by means of gearing and a crank, to the main wheels which carry them, so that as they travel forwards a rapid reciprocating motion is communicated to the knives. They pass between and cut against fixed guards or fingers, which support the straw and prevent it from yielding sideways, and serve also to protect the knives from injury on rough and stony ground.

The shape of the knives varies in the different machines; in Hussey's they form a very acute angle with the guards, are plain-edged, sharp, and chop off the straw by means of their rapid motion through the fingers. Mr. M'Cormick's knife has a serrated edge with an obtuse angle, and requires the aid of a fan or reel to hold the corn in order to cut clean, but it is much more easily worked, more durable, and less liable to choke, than Hussey's, and by those who have tried both is generally preferred. Bell's original machine cut by means of shears resembling large sissors; but though very efficient in operation they were found difficult to keep in order, and a serrated knife something like M'Cormick's was substituted for the shears in the year 1854, and has been successfully used since that time. An inspection of the models will enable any one to understand the general action of the cutters and guards, and the special difference between each variety of knife is shown by the specimens on the table.

It is worthy of remark in connection with the cutting apparatus, that numerous endeavours have from time to time been made to supersede the necessity of giving a reciprocating motion to the knives, as the reverse action is a source of considerable loss of power, and the tremulous vibration it produces in the machines is a great cause of their wear and tear. All attempts have, however, hitherto failed in producing an efficient cutter with a continuous motion, and in the opinion of the writer there is little probability of their success, as actual experience in the harvest-field seems to prove that the reverse or reciprocating motion of the bar and knives is necessary to shake out from the guards pieces of short straw, grass, weeds, and other substances which constantly collect there, and if not quickly removed soon choke them up and stop the action of the cutters. A complete collection of all the schemes known to have been projected for cutting corn, was published by Mr. Woodcroft, of the Patent Office, in the year 1852, and forms a record worthy of the attention of the curious in such matters; it should serve also as a warning to inventors generally to make actual trials of their crude schemes before wasting their money in taking out patents for them, as the great majority turn out entirely worthless in practice.

The different methods of delivering the cut corn will be best understood from a brief description of how it is disposed of by each machine, beginning with Hussey's, which is the simplest, and may be termed the elementary reaper. In this implement the corn falls, as it is cut, upon a platform behind the knives; a man rides on the box which covers the wheels and other gearing, and forms a seat for him; and as soon as a sufficient quantity has collected to form a sheaf, he pushes it off the platform by means of a rake with which he is provided. When this operation is performed by a skilful workman on a moderately light crop, which can be managed without too much exertion, it has a particularly neat and tidy appearance, the corn is left in sheaves, ready for binding immediately; and the result is attained by the simplest possible means, as there is no gearing required except that for driving the cutters; and the simplicity of the implement contrasts strikingly with others which have machinery necessarily more or less complicated for effecting the delivery of the cut corn. On the other hand, to do the work neatly and efficiently, requires a man both strong and skilful, especially where the crops are heavy, and such a man is not always to be obtained. It is, therefore, not surprising that this machine is much better liked in America, where the crops are generally thin and light, than in this country, where on all good farms the weight of the produce is too great to admit of its being readily moved as fast as cut by the unaided strength of a single workman. It will also be observed that the sheaves are deposited on the ground behind the machine, and must therefore be removed out of the way of the horses before they can pass to make the next cut; and in practice this is found a great disadvantage in comparison with the work of the machines with self-acting deliveries, which deposit the cut corn on one side, so that its instant removal is not necessary.

M'Cormick's reaper, as first introduced from America in 1851, resembled Hussey's in requiring a man to ride on it for the purpose of raking off the cut corn, but the gearing was placed before the platform, so that the sheaves could be raked off to the side of the machine, where they were out of the way of the horses when making the next cut; but the work of the man was far more laborious than with Hussey's reaper; and in most of the heavy crops of this country it could not be performed. This difficulty with M'Cormick's machine was overcome by Messrs. Burgess and Key, of London, who constructed and patented for it a self-acting apparatus for delivering, consisting of three rollers in the form of endless screws, which carry the cut corn off at the side of the machine, and leave it in a continuous swathe ready for taking up and binding. The engraving of the reaper at work shows the action of the screw delivery, and is a very good representation of the implement drawn by two horses and driven by a boy. Since the introduction of Messrs. Burgess and Key's improvements, this machine has been very extensively used; and when managed with proper care and attention, is capable of doing excellent service.

In Bell's reaper, as improved and re-constructed at Beverley, under the direction of the writer, the delivery is effected by means of a number of endless bands of vulcanized Indian rubber, fitted with projecting pieces of wood, which carry the cut corn to the side of the machine and deposit it on the ground in a regular and continuous swathe, as shown in the engraving. In the original machine a cloth carried along by pitch chains was employed for this purpose, but the bands are found equally efficient, not so liable to get out of order, and more easily worked by the horses than the cloth and pitch-chains. The large model on the table is fitted with the shears and the cloth, as used in the original machine; the small models show the improvements which have been made in it, and the form in which it has been practically found to work best.

It will be observed that both the machines, with self-acting delivery, leave the corn in a continuous swathe, which must be raked together for binding, and a practically useful intermittent, or sheaf-delivery has not yet been effected by machinery, although several attempts have, from time to time, been made to accomplish it.

A cursory inspection of the models and engravings shows a striking difference in the general arrangement and construction between Bell's reaper and that of both the American machines just described. In the latter the horses walk by the side of the corn to be cut, and draw by means of a pole connected to one side or end of the machine, a mode of attachment productive of considerable twist or torsion, especially when the work is severe. Bell's machine goes before the horses, and is propelled by means of a long pole passing between them, to the end of which they are harnessed, and by means of which the man who follows and drives them steers the reaper in any direction. This mode of attachment is attended with the great advantage of enabling the machine to deliver the cut corn on either side, while all the reapers which have the horses in front are confined to one side only for delivery, and cannot go backward and forward along a field, but must either go round the crop, or, when circumstances render this impracticable, must return idle; on the other hand, machines having the horses in front are somewhat more manageable and easily turned than Bell's, and, in cases of need, a third horse can be yoked in front, which is not practicable when the machine is placed first. For these and other reasons connected with practical convenience, both makers and users of reapers are much divided in opinion as to which is the best way of attaching the horses. Both methods have warm advocates, and it appears probable that until considerably more experience has been gained in the practical use of reaping machinery, and perhaps even after that, on account of the variation in convenience under different circumstances, both methods will continue to be employed.

It will be observed, also, both the machines with self-acting delivery, carry in front of the cutters an apparatus called a fan or reel, which revolves slowly as the machine advances, puts back the corn, and insures its falling in the proper direction; an operation which in Hussey's machine is done, when necessary, by the man with the rake.

A general description of reaping machinery would not be complete without an allusion to various ingenious contrivances which have been projected from time to time for the purpose of delivering the cut corn. Through the kindness of Messrs. Ransomes and Sims, of Ipswich, I am able to exhibit a working model of one of these, consisting of an exceedingly curious automaton or self-acting rake, invented by a youth in America, named Atkins, and sent over to England in 1853. It was applied to a machine similar in construction to Hussey's, and was intended to deposit the corn on the ground in sheaves; but it has not yet been made to do so in a sufficiently perfect manner to justify its general introduction, although its extreme beauty and ingenuity lead to the hope that it will at some time be turned to account. Another machine, with a very clever contrivance for giving a self-acting motion to a rake for performing the work done by the man on Hussey's reaper, has just been sent over from the United States to Mr. Samuelson, of Banbury, by Messrs. Seymour and Morgan, of Brockport, near New York; it has been named the "Britannia Reaper," and the *Mark Lane Express* and other agricultural journals contained last week accounts of various successful trials that have just been made with it in the North of England. Having seen it for the first time on Monday last, I have been unable to get a model of it for exhibition here, and the mechanical arrangements are so peculiar, that a description of them would be unintelligible without a model. I may state, however, that there is every probability of its turning out practical and useful as well as ingenious, and in the hands of Mr. Samuelson we may rest assured that its capabilities will be fully developed.

In making a few observations on the practical use of reaping machinery, it is necessary to direct attention to the extremely variable and uncertain nature of the circumstances under which it has to operate. A week of heavy rain before harvest will sometimes lay the corn in whole districts, so that it cannot even be mown with a scythe, and it is not probable that machinery will ever be made to work under unfavourable circumstances of this description. It is, however, certain that the reapers as at present constructed are able to render important assistance to the farmer in moderately favourable seasons.

The use of both reaping machines with self-acting delivery is steadily extending; and as agriculturists and their men become more accustomed to them, their introduction will be still more rapid; for, owing to the high price of labour during harvest, they effect a considerable saving in the cost of cutting the crop, and enable the farmer to take more advantage of favourable weather than he can do by the uncertain aid of the limited number of men that can be procured at that period of the year.

It is also worthy of remark in connection with this part of the subject, that, excepting the locomotive engine, there is no machine in use which requires to be manufactured with so much care and regard to durability as the reaper. Almost all other machines used either in agriculture or manufactures do their work when at rest, and secured to substantial foundations. Even those constructed to move from place to place are, before being put in motion, fastened down, to prevent, as far as possible, the destructive consequences of oscillation and vibration. The reaper is, on the contrary, not only exposed to all the strains consequent on passing over every description of uneven ground with its machinery in action, but it is also subject to the effects of continual tremulous vibration, caused by the quick reciprocating motion of the knives.

It is, therefore, not surprising that the introduction of reaping machines has been attended with considerable difficulties, especially as they have had to be worked by men but little accustomed to the use of machinery. In this respect, however, the last few years have witnessed a great change. The assistance of the steam engine is already felt by most farmers to be a necessity in carrying on all extensive operations with efficiency and economy, and the general use of improved machinery cannot fail to produce a corresponding improvement in the condition of the agricultural labourer, and will accelerate the completion of that progressive revolution which, since the abrogation of legislative protection, has been rapidly taking place in every department of practical agriculture.

The Manufacture of Iron in the Neighbourhood of Leeds.

The following paper, by W. J. **Armitage**, was read before the Mechanical Section:—

The object I have had in view in collecting the following facts, is to bring before the notice of this section of the British Association a few points connected with the manufacture of pig metal and iron in the neighbourhood of this town.

As an introduction to the remarks I have to make, allow me to refer you to a paragraph in reference to this district, contained in the memoir of the "Geological Survey of Great Britain, and of the Museum of Practical Geology for 1856.

"The coal field of Yorkshire may be considered, especially in respect to its iron manufacture, as admitting of division into two parts, the northern and southern districts. In the former, the lower part of the strata is developed to a degree of importance not seen in the south, by the occurrence of the beds of ironstone and coal, which have given rise to the establishments of Lowmoor, Bierley, and Bowling, celebrated for the production of the best irons in Britain, and to that of Farnley, which is following in the same steps.

"The castings from these works are largely employed for special purposes where strength and tenacity are required, as for mortars and sea-service guns. Their wrought-iron has the peculiarity of a granular structure, with a uniform small and brilliant grain, which closely resembles the character of Swedish bars. The superiority of the North Yorkshire iron proceeds from the care and attention bestowed upon the various processes, and from the admirable character of the seam of coal termed the Better Bed, differing from ordinary seams in its remarkable freedom from iron pyrites and other impurities. You may pass through the coking heaps or ovens without the least inconvenience from the sulphurous gases, which, in the coking of most coals, are so freely liberated."

Having extracted these few remarks from the memoir alluded to, I now proceed to point out the position occupied by this valuable seam of coal in the geological strata of the Bradford and Leeds districts.

The superficial seams of coal worked in the immediate neighbourhood of Leeds are unconnected with the manufacture of the iron. I will, therefore, confine myself to a mere enumeration of these various measures in the order in which they are to be found:—

1. The stone or cannel coal.
2. The Middleton bed.
3. The Beeston thin bed.
4. The Beeston thick bed.
5. The Crow coal.

Below the latter seam of coal we arrive at that portion of the strata especially connected with the manufacture of iron in the North Yorkshire district.

A section of this part of the strata gives the following results:—

1. Loose vein of sandstone, 9 to 18ft. thick.
2. Black bed ironstone, lying in a bed of shale, 3 to 4ft.
3. Black bed coal, 2ft.
4. Various measures of shale and stone. Roof of Better Bed coal, consisting of black shale with numerous fish remains, and small white nodules of ironstone, 120ft.
5. Better bed coal, 1 to 2ft. 6in.
6. Floor of indurated fireclay, 2 to 3ft.

From this portion of the strata, comprised within the short space of 40 yards, the materials employed in the manufacture of the iron are derived. The black-bed ironstone furnishes the ore. The Better Bed coal the fuel. The black bed is used for the engines, and from the valuable bed of fireclay are made the bricks and blast furnace linings.

The ironstone occurs in detached nodules of various sizes, deposited in five distinct layers, which are designated as follows:—Top balls, flatstone, upper rough measure, middle balls, lower rough measure (small ragged pits).

The superposition of these different measures is apt to vary. In some localities their course is difficult to trace in the surrounding shale. In others, where the seam is termed good, they appear to have been deposited with the most remarkable regularity, and to have remained undisturbed in the same state which had been assigned to them at the first formation of the strata.

In the last case the ore is worked with greater economy, and yields a larger quantity of stone per acre. 1,000 tons per acre is about the average yield at Farnley.

The fracture of this stone shows a blackish-grey tint, and yields by analysis:—

Metallic Iron	39·4 per cent.
Silica and Alumina	14·9 ,, ,,
Sulphur	·8 ,, ,,
Oxygen, Carbonic Acid, &c.	44·9 ,, ,,
	100·0

Although it would appear from this analysis, compared with the analysis of other ores in the kingdom, that there are no peculiar properties connected with the ironstone of this district, either as regards quantity or quality, to account for the excellence of the iron produced, it is, however, worthy of remark that a singular affinity or kindliness seems to exist between the ore and the Better Bed coal. The result of trials with other ores have been anything but satisfactory.

We now come to examine the fuel employed, and the first point that strikes us in burning a piece of Better Bed coal is its freedom from sulphur.

It is a well-known fact that sulphur is one of the chief obstacles in the manufacture of iron in this country. A very small proportion of this element entering into the composition of the iron will cause the latter to be brittle, and thereby render it unfit for purposes where great strength and toughness are required.

It is to the absence of sulphur that charcoal iron owes its pre-eminence. Hence the superiority of Russian and Swedish irons, and, in general, most irons manufactured with charcoal. The Better Bed coal (in its freedom from sulphur) is, I believe, of all the coals in the United Kingdom, the one which approaches the nearest to charcoal.

I have had one sample of this coal analysed lately by Mr. Wood, of this town, and the following are the results:—

Carbon	74·700
Hydrogen	5·000
Sulphur	·196
Ash	4·700
Oxygen and Nitrogen	15·404
	100·000

Other analyses will have to be be repeated on different samples of this coal before the average amount of sulphur can be determined with precision.

This first essay, however, is satisfactory, inasmuch as it places the Better Bed coal of this district in the foremost rank amongst the pure coals of England, and it is (as has been stated in the memoir alluded to in the commencement) to its exclusive use as a fuel, that the good quality of the iron manufactured at Lowmoor, Bowling, and Farnley is mainly attributable.

It is not my intention, sir, to take up your valuable time by entering into the details connected with the manufacture of iron in this district, although much could be said on this subject, for much has been done. My object, however, is to bring before your notice two points of importance in connection with the process of refining the pig metal at the Farnley Iron Works, and which are peculiar to that establishment.

The first has reference to the introduction of steam into the refinery along with the blast. The results hitherto obtained by the adoption of this process are satisfactory, inasmuch as the quality of the iron has been improved; especially with regard to boiler plate.

The second point to which I desire to call your attention, is the introduction of steel into the refineries in conjunction with the pig metal.

Converted bars of steel in various proportions are melted in the refinery along with the pig. A perfect mixture is thus obtained, and the refined metal produced presents a pure silvery fracture and a perfectly homogeneous texture.

The metal thus obtained is worked with much greater facility in the puddling furnaces. A puddler operating on ordinary metal, works up 9 heats (300 lbs.) in his turn of 12 hours; whereas, with refined metal, composed of two parts pig and one part steel, he can get through 12 heats in the same time.

The stampings and lumps are then taken through the ordinary processes, and the finished iron obtained from this metal is, to all appearances, of a very superior quality. It welds and punches remarkably well, and its fracture presents a very fine close grain.

It would be premature on my part to make any comparison between the quality of this "steel iron" and that of the ordinary iron of the district, until proper and well-conducted trials have been made with respect to their strength and durability.

Messrs. Kitson and Co., of this town, have undertaken to test the boiler plate and bar iron, and two sets of locomotive tyres are now running on the London and North Western line, and Mr. McConnell has promised to give an account of the manner in which they have worn.

SUBMARINE ELECTRIC TELEGRAPH.

Mr. Henley, of Greenwich, has completed a submarine cable of 240 miles to connect the island of Tasmania with Victoria, Australia. It will be laid from Cape Otway, Victoria, to King's Island, Bass's Straits, from King's Island to the River Mersey, and from the Mersey to Georgetown Heads, the entrance to the port of Launceston, Tasmania. The conductor is covered with gutta percha, and the gutta percha serving with Russian hemp, saturated with a mixture of Stockholm tar, linseed oil, and Russian tallow. The outer covering spun round this serving of hemp consists of 10 solid iron wires. The weight of the cable is two tons to the statute mile.

SOUTH KENSINGTON MUSEUM.

During the week ending October 23, 1858, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 2,078; on Monday and Tuesday (free evenings), 2,006. On the three Students' days (admission to the public 6d.), 614; one Students' evening. Wednesday, 142. Total, 4,840. From the opening of the Museum, 646,460.

Home Correspondence.

THE LATE THOMAS TREDGOLD.

Dear Sir,—The enclosed letter from the late eminent engineer, Mr. Tredgold, to a deceased friend of mine, possesses points of interest which may perhaps be acceptable to the readers of our *Journal*. If you also think so, it is quite at your service.—I am, &c.,

THOS. WINKWORTH.

Gresham Club, Oct. 18, 1858.

16, Grove-place, Lisson-grove, Feb. 16, 1828.

Dear Sir,—Algebra is to mechanics what money is to mercantile people; it enables one in small compass to keep the debtor and creditor account between power and resistance, the final equation is the balance sheet of the transaction; but, unfortunately, if either of these be shown to men in certain states of society they are considered of no value; in another state, the value of the balance sheet has become known, and seeing that certain crooked and straight lines marked on a sheet of paper may represent the state of a man's concerns with admirable certainty, there is room for conjecture that the crooked lines of algebra may be equally certain and valuable; but that value has no measure, because a man cannot measure the value of that he doth not comprehend; but, in such a case, he has some idea of encouraging the thing, and watching the progress of its fruits; and, verily, I would have no great objection to the schoolmaster of Neath being occasionally called into request, and do most earnestly recommend that it be done when occasion renders it desirable. I, however, knew that ancient habits and methods are not easily changed; and, therefore, reduced all the rules that would easily bear it to words at length, with easy examples, and think that any person knowing the common rules of arithmetic may calculate all the proportions of the parts of the engines usually made; but, for fear this should not be so, there are two tables of the proportions for all power from 1 to 200 horses' power of double acting engines, and from 10 to 200 horses' power for single engines. Again, if any difficulty should arise, I am within the reach of the post, and, further, would willingly add Mr. Vigurs' name to the list of my correspondents. The best thing would be for Mr. Vigurs to get the book,* make choice of the kind of engine, settle the power, or state the duty he wished it to perform, and then give me an order for a set of working drawings to execute it by; the expense of which would be at the rate of 3½ per cent on the cost of the engine, and he should estimate the cost at his own rate, provided he does not get it below £20 per horse power for a 10 horses' power engine. I have made two sets of drawings for steam-engines this year, and I am happy to find that more people begin to make use of this simple and cheap means of having the ideas of a person who has devoted his life to such subjects, and has given the world samples at large to choose out of. Five per cent. is given for the plans of a house, but an engine it is much more important should be good, for otherwise it may be a source of hourly loss.

If you will be so good as to notice the parts which apply to the case and to the man, and select those which will have the most weight in determining him to have a set of drawings as well as the book, you will serve both him and me.

As a sample of the march of intellect, suppose old Robert Recorde, the first English writer on arithmetic, endeavouring to teach a merchant the use of that art, whose mind is occupied in ascertaining its advantage over the notches of his tally sticks, half inclined to think the latter the best. Set the painter to work, and exhibit at the R. Exchange for the benefit of the Robert Recordes of the day.

It is chiefly owing to being opposed to Mr. H's doctrines in some points that I have not followed the subject (of Political Economy) up so closely as I intended; there is a certain degree of not-meddling with trade which it appears to me is most desirable, but it appears equally so that when a large proportion of a population are embarked in a particular kind of trade, they should be protected from the competition of foreigners in the home market, and particularly when the commodity is one of the necessaries of life; the degree of protection to be such as barely saves the home producer, that he may be induced to turn to some new line of production, for the population must either produce new articles to be equivalent to the foreign goods, or they had better continue to produce the old articles. One state is as one firm—the good of the whole is the object.

Consider this point against I have the pleasure of seeing you.

I am, dear Sir,
Your most obedient servant,
THOMAS TREDGOLD.

To John Vigurs, Esq., Cwm Avon.

WATER POWER.

Sir,—As you have been pleased to notice the paper I read at Leeds, on "The Economy of Water Power," permit me to send you a short account of an elegant and useful application of water pressure I saw at work there.

The Town-hall of Leeds contains a powerful organ, which is blown by the pressure of water from the main pipes that supply the town. A branch pipe, fitted with a regulating tap, conveys the water to the organ, where its pressure, acting against the piston of a small cylinder, like that of a steam-engine, produces a reciprocating motion, which blows the bellows.

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* It would be worth his while to see the book, to consider how far the new methods proposed to render the engines more simple and effective, can be adopted so as to render him successful as an engine-maker of the first rank; he having the advantage of easy access to the scientific and draftsmen's parts, might render his works a rival of Soho.

As the air-chest fills, a lever attached to it acts upon the regulating tap before mentioned, and lessens the supply of water, so that the piston goes more slowly, but, as the organist requires more wind, and the air-chest falls, the regulating tap is opened, the action of the piston becomes more energetic, and the supply of air keeps pace with the demand, so that the organ is much more evenly blown by the machinery than it can be by men working the bellows.

This is but a brief outline description of the apparatus, for there are several ingenious contrivances about it which have been found requisite to ensure its success in practice, and they do great credit to the mechanical skill of Messrs. Joy and Holt, of Leeds, who have taken a patent for their application of water power to this purpose.

A smaller organ, suitable for a drawing-room, also blown by water pressure applied in the same way, was in use at the Leeds Exhibition of Local Industry during the meeting of the British Association, and a sectional model of the apparatus was placed beside the organ.

I need not enumerate the great advantages of having motive-power always ready to blow an organ, so that the player has merely to turn it on, as it were, by drawing a stop. A lady, an amateur, an invalid, or even a professional organist, may practice or amuse themselves when they please to do so without the help of an organ blower, if the instrument be large, or without blowing by the foot of the performer, as is usual in smaller organs.

Many attempts have been made to apply mechanical power to blow organs, and, in some cases, water-power has been tried. The writer remembers, many years ago, a lady who was an excellent performer, and had a large instrument in her house requiring a man to blow it, until her husband, who was an engineer, had a small water-wheel placed outside of the house, which could at any time be put in action by drawing a stop attached to the sluice, and so turning on the water, when a crank fixed upon the axis of the water-wheel worked the bellows; but, in this case, the action was uniform and constant, unless the performer varied it by regulating the quantity of water with the sluices, whereas in the Leeds organs this regulation is effected by the machine itself, without care or thought on the part of the player, and with such a degree of apparent adaptation to the performance exhibited in the movements of the machine, that it seems to know what to do and when to do it.

I may add that the apparatus is not costly, and that the expense of water is not equal to a labourer's wages, where a pressure of only ten pounds on the square inch can be obtained. I am, &c.,

JOSEPH GLYNN.

28, Westbourne park-villas, London, W.,
October 25, 1858.

Proceedings of Institutions.

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Banbury.—The half-yearly meeting of the Mechanics' Institute was held on Wednesday, the 29th Sept., Mr. Brooks in the chair. The reports for the last half-year were read and unanimously adopted. They were of a highly satisfactory and encouraging nature. The general report, read by the secretary, states that a great improvement has taken place in the monetary condition of the Institution, and the committee hope to be able to add very considerably to the library during the coming half-year. Since the last meeting a musical soirée has been held in the town hall, when several gentlemen and ladies gave their gratuitous assistance. On the 23rd of June the annual pic-nic was held, by the kind permission of G. G. Harcourt, Esq., M.P., in the grounds of Nuneham; and about 400 of the members and their friends availed themselves of the excursion. In addition to the enjoyment of a very pleasant day, the funds of the Institution were increased by the sum of £10 12s. The following are the lectures arranged for the present season:—Basil Young, "On the Life of George Stephenson;" Lizzy Stuart, "On the Ploughman Poet," a musical entertainment; J. Bennett, F.R.A.S., "On the Watch;" George Dawson, M.A., "On Daniel Defoe;" Mrs. Bessie Inglis, "On the Influence of Woman on Society;" George Grossmith, "On Pickwick;" The Rev. J. J. Brown, "On the Natural History of a Book;" J. Wild, "On Music;" F. Warren, C.E., "On the Education of the Workman and his Work—the result of both." The Committee, with a view to promote the convenience of the entire body of the members, have determined that all the lectures shall be delivered at the town hall, in order that the reading-room and library may remain open for the benefit of those who do not wish to attend the lectures. The lecture on the Life of George Stephenson was not well attended, but Miss Lizzy Stuart's musical entertainment was very successful, and the committee are pleased at being able to state that in consequence no loss has as yet been sustained on the lectures. The committee report the promise of a subscription of £10, by B. Samuelson, Esq., towards the lecture fund. The sum of £10 was awarded to the Institution by the Society of Arts for the success of its candidates at the last Examination; and it has been determined (with the view to promote the education of the members) to devote it towards paying one-half the cost of members of the Institute attending the classes.—Mr. Gibbs moved the adoption of the report, in so doing briefly referring to the satisfactory condition, more especially financially, of the Institution, which, instead of being in debt, would have a balance of £49 7s. 4½d. to its credit, when the various amounts due on account of members' subscriptions, &c., were paid in.—Mr. Boss then read his report as librarian, from which it appears that the present number of members is 204. The following classification of them shows that, to a certain extent, the Institution has the support of all classes:—1 peer; 1 member of parliament; 1 clergyman; 3 magistrates; 6 bankers; 7 professional gentlemen; 9 schoolmasters, mistresses, and teachers; 48 tradesmen; 36 clerks, 41 tradesmen's assistants; 31 mechanics; 20 without any particular calling, youths, &c. The number of books issued from the library during the past half-year is 1,875, making more than 4,000 circulated in the year. There has been a greater demand for books of an elementary and scientific character than is usual, during the last few weeks. 19 new members have already entered the Institution in this, the Michaelmas quarter.—The election of officers then took place, and the proceedings terminated by votes of thanks to the librarian, the secretary, and treasurer, which those gentlemen respectively briefly acknowledged.

London Mechanics' Institution.—Lord Murray has written to Mr. T. J. Pearsall, the corresponding secretary, expressing his concern that the parent Mechanics' Institution of England should be in need of extraneous assistance, and enclosing a draft for £100 in aid of a fund for purchasing the lease of the building, and thus extinguishing the heavy annual charge for rent. The total amount to effect this desirable object is £3,500. The subscriptions from private sources amount to about £400, and a public appeal is shortly to be made.

Manchester Athenæum.—A soirée, composed of the members and friends of the Manchester Athenæum, took place on Thursday evening, the 21st October, in the Free Trade-hall, at which more than 2,000 were present. Among the guests present on this occasion were Lord Stanley of Alderley (who presided), Lord J. Russell, the Hon. Judge Haliburton, Professor Aytoun, Sir James Brooke, Mr. Monckton Milnes, M.P., Mr. W. M. Massey, M.P., Mr. James Kershaw, M.P., Mr. William Brown, M.P., Mr. John Cheetham, M.P., Mr. J. P. Brown-Westhead, M.P., Mr. James Grant, of Edinburgh, Mr. G.

Cruikshank, &c. The following gentlemen were upon or near the platform:—Admiral Smyth, Cols. Wilbraham, M'Mahon, Bond, Servante, Hodges, Kennedy; Mr. Ivie Mackie, Mayor of Manchester; Mr. W. Harvey, Mayor of Salford; Rev. Dr. Petrulias, Alderman Sir Elkanah Armitage, president of the Institution; Sir James Watts, Neild, Watkins, Willert, Clark, Heywood; Mr. Thomas Wright, "the prison philanthropist;" William Fairbairn, F.R.S., Thomas Bazley, Oliver Heywood, Samuel Brooks, Malcolm Ross, A. Schwabe, H. P. Rée, John Reid, W. R. Wood, Thomas Clegg, Thomas Barge, jun., James Crossley, Joseph Heron, the Belgian Consul (Mr. Kissel), the Very Rev. the Dean of Manchester, the Hon. and Rev. Mr. Byng, the Rev. Mr. Birch, the Mayor of Ashton, Sir James L. Bardsley, M.D., Lieut. Sturt, Messrs. Joseph Adshead, C. J. S. Walker, Capt. Palin, Messrs. J. D. Mackenzie, C. Swallow, W. W. Goulden, R. P. Willock, Isaac Gregory, and Dr. Hudson, the secretary of the Institution.—The Chairman said that the Manchester Athenæum was the first association of the kind which recognised the propriety of educating the people by means of attractive literature, by consulting their tastes and interests, and not by cramming philosophy and hard sciences into them; and by providing them with good and useful books, and above all with newspapers. It had long been found necessary by Mechanics' Institutions to speak to men rather through their feelings and tastes than to compel them to be too wise all of a sudden. It had struck him that there was great justice in the remarks of Mr. Sotheron-Estcourt, who, referring to the lamentations of many people upon the difficulty of keeping boys at school until they could obtain complete instruction, said he felt that it was a great evil to compel them to attend school beyond the time for which their circumstances allowed them to stay. Mr. Sotheron-Estcourt stated that he had made a successful experiment with such boys. During the wars in the Crimea and in India he had invited the boys in his parish to meet him, either to hear a short lecture, or to listen to the reading from a newspaper, by one of their own number, of an account of the proceedings at the seat of war. By that means he induced them voluntarily to continue their studies; and by degrees they expressed a greater anxiety to instruct themselves. The chairman then made some general remarks on the advantages of education and of the spread of cheap literature, and concluded by introducing Lord John Russell to the meeting.—Lord John Russell, after expressing his surprise that some attacks had been made upon him in a local newspaper of large circulation, for having accepted the invitation to be present on this occasion, said that one of the principal benefits derived from such meetings as the present was, that persons from different parts of the country, and persons engaged in different situations in life—some political, some literary, some industrial—were induced to meet together and to express good-will and fellowship towards each other. We had in this country a great deal of attachment to our private life. We boasted of our affection for our homes very justly, but we had not the public life which was common in some ancient republics, nor that sort of public life which he understood now existed in some of the United States of America. And the more we were attached to private life, the more necessary it appeared that we should now and then mingle together and exchange good wishes. In considering the purposes of the Institution which they came there to support, he found, in the first place, that newspapers were read, next that books are taken out very largely from the library and perused by the members. With regard to newspapers, it was quite obvious that there must always be a great interest attached to the matter contained in them, and, with regard to the library, he found that, of about 28,000 books taken out to read, there were above 17,000, or near 18,000 of novels, and about 10,000 of works of history and of all other descriptions. He thought this was a very creditable account. So far from being shocked at the quantity of novels that were read, he really did not wonder that men who had occupations that gave them a great deal of care and anxiety should resort to those delightful fictions which went by the name of novels, and that they should seek in those pages relaxation after their harrassing employments. So, looking at another institution, the free library of that town, there were about 40,000 novels to about 23,000 books of other descriptions—a somewhat similar proportion, and one which he thought did great credit to the readers, because it showed that there was a very fair proportion—upwards of one third—who did read books of an informing and instructive kind. What then would be the effect of all this increase of knowledge and instruction? He could not but believe that it would make the persons who possessed it happier, and the institutions of the country safer than they were before. If a man could abstract his attention, for a portion of the day, from the care and anxieties of his ordinary occupation, and could look into the past, or be interested in some tale, or, still more, be raised by the sublime songs of our poets, much he thought was gained for the elevation of his moral nature and the happiness of his daily existence. It was characteristic of the political institutions of this country, that while the fullest protection was given to life and property, there was at the same time the greatest liberty of opinion —the utmost power given to every one to express his opinions—to form any opinion that he chose, and to express that which he thought. If that was the case, it gave an additional importance to all these societies for literature, for education, and for improvement; because it gave to every man the means, if he had the wish and the ambition, and the talent, of rising in the society to which he belonged. If such was the spirit of our institutions, it was of great importance not only to us but to the world in general, that we should hold on steadily in our course. We had, as had been said long ago, "a precedence in teaching the nations how to live." That precedence was not to be maintained by any carelessness, by any ignorance, or by any precipitation, but by the people of this country being thoroughly and well informed, weighing what they are about to do, taking counsel from the lessons of others, and examining their laws with a critical, but not with a prejudiced or unfriendly eye. Believing in the high character of this people, in their natural good sense, he delighted in every occasion in which he saw that the knowledge of the people of this country, and with their knowledge their power, was making advance. After referring to the statue of Mr. Joseph Brotherton, M.P., and the great private and public usefulness of that gentleman, as a proof of the kind of man whom Manchester loved to honour, his lordship concluded by saying that he believed increase of knowledge would bring with it increase of veneration; and that the more we knew, the more we should bow to the wonderful works of Almighty wisdom. —Professor Aytoun, after some introductory remarks, said he had lately arrived at the conclusion that while people elsewhere had been talking vaguely, and, in some cases, foolishly, upon the subject of education, Manchester had been quietly doing everything. He believed the Free Library in Manchester to be unequalled in the world; and he found that, having been in operation for a considerable period, it now furnished precisely the data which statesmen and philanthropists had been for a long time attempting to find out—namely, what was the kind of reading that ought to be given to the people. Why, of course, the kind of reading to be given to the people was that kind which the people would accept. He found that the standard works of imagination were those most in favour with the people, and he thought it a great mistake to expect that all working men should be made scientific philosophers. Let the people be only taught to read; give them the power of understanding; give them libraries, as Manchester had done, and they would have given to the mechanic the basis of his own education, and have placed it within his power. He was extremely glad to see, from the report, that the evening classes had been cultivated to a great extent—classes in French, German, chemistry, and several other branches of popular learning—attended by young men who only had leisure during the evening. But he was disappointed that the system of lectures had been discontinued in the Athenæum. He knew that many objected to them as superficial things, on the ground that those who attended three or four lectures could merely acquire a smattering of a subject. That was undoubtedly true at present. But the great thing was to get men who could well handle their subjects, and who should select such subjects as would be of real interest to the community, and yet not too deep or too affected. Professor Aytoun concluded by advocating oral teaching, and especially the reading aloud to large audiences of great works of imagination. The meeting was then addressed by the Hon. Judge Haliburton, Sir James Brooke, K.C.B., Mr. Monckton Milnes, M.P., and Mr. George Cruikshank. On the motion of Mr. J. Cheetham, M.P., seconded by Mr. J. P. Brown-Westhead, M,P., a vote of thanks was passed to Lord John Russell for his attendance and address; and a similar compliment was paid to the chairman for presiding, on the motion of Mr. James Crossley, seconded by Mr. Malcolm Ross. The proceedings then terminated.

MEETINGS FOR THE ENSUING WEEK.

Mon. ......British Architects, 8. Mr. W. Tite, "Observations on the recent discoveries of the remains of the Mausoleum at Helicarnassus."
Wed. ......Geological, 8. I. Rev. O. Fisher, "On some natural Pits in the Tertiary Lands of Dorsetshire." II. Dr. Rubidge, "On some points in the Geology of South Africa." III. Mr. W. Stow, "On some Fossils from South Africa." IV. Mr. N. T. Wetherell, "On some of the Siliceous Nodules of the Chalk."
Thurs. ....Linnæan, 8. Mr. George Bentham, "Notes on British Botany."
Zoological, 3.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, Oct.* 22, 1858.]

Dated 30*th June*, 1858.
1472. B. Nicoll, 42, Regent-circus—Imp. in circular knives and saws.
Dated 16*th August*, 1858.
1870. P. Richard, 17, Rue St. Jean, Faubourg St. Germain, Paris—Imp. in apparatus for obtaining motive power.
Dated 25*th August*, 1858.
1928. J. Dredge, Walcot, Bath—Imp. in condensers for steam engines, and in pumps for working such condensers, or for lifting water from deep mines, and for any other use to which pumps are applicable.
Dated 26*th August*, 1858.
1936. G. M. Sautter, 14, Boulevart Montmartre, Paris—Imp. in telegraphs. (A com.)
Dated 10*th September*, 1858.
2050. J. L. Chester, Philadelphia, U.S.—Imp. in self-priming apparatus for fire-arms, and in the preparation of percussion primers to be used therewith. (Partly a com.)
2054. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in Jacquard machines. (A com.)
Dated 11*th September*, 1858.
2062. W. Baker, Kingston-upon-Hull—Imp. in preparing food.
2064. J. M. Courtauld, Braintree, Essex—An imp. in clearing and preparing silk crapes, aerophanes and other like fabrics, lisses and other gauzes and lace, and in machinery employed therein.
Dated 13*th September*, 1858.
2076. R. Frost, Steam Mills, and A. Rigg, Park gate-road, Chester—Imp. in apparatus for cleaning grain or seeds and bran.
Dated 14*th September*, 1858.
2084. W. J. Hoyle, Huddersfield, and R. Howson, Lancaster—Imp. in arrangements and mechanism, or apparatus for signalling by sound.
Dated 18*th September*, 1858.
2104. G. Ostermoor, 37, Basinghall-street—Ornamenting boas, victorines, and muffs.
Dated 20*th September*, 1858.
2112. J. L. Chester, Philadelphia, U.S.—An improved cartridge opener and ramrod fastener. (Partly a com.)
Dated 24*th September*, 1858.
2144. E. T. Wright, Wolverhampton—A new or improved method of, and apparatus for, preventing the explosion of or injury to steam boilers through deficiency of water.
Dated 25*th September*, 1858.
5152. A. F. Delacroix, Chartres, France—Imp. in locomotive engines.
2156. C. Hall, Navestock, Essex—Imp. in apparatus for applying power to the cultivation of the soil.
2158. J. C. Dieulafait, 2, Rue Sainte Appoline, Paris—A kind of garment which may receive different forms according to the will of the wearer.
Dated 28*th September*, 1858.
2164. E. Lewthwaite, Halifax, and G. Ambler, Queen's Head, near Halifax—Imp. in clocks, watches, chronometers, and other timepieces.
2166. J. H. Linsey, 4, Grocers' Hall-court—Certain imp. in binding or covering books.
2168. J. L. Clark, Adelaide-road, Haverstock-hill—Imp. in coiling and securing telegraph cables preparatory to laying them from ships or vessels.
Dated 29*th September*, 1858.
2170. J. Luis, 1B, Welbeck-street, Cavendish-square—A new method of fixing pastel pictures. (A com.)
Dated 30*th September*, 1858.
2174. J. Wright, Birmingham—Certain imp. in the mode of arranging and moving fire-bars for locomotive, puddling, and other furnaces.
2176. S. Taylor, Rochdale, Lancashire—Certain imp. in apparatus to be used as a fire-escape, which improvements are also applicable to other similar purposes.
2178. H. Kinsey, W. H. Morrison, and S. Smithard, Nottingham—Imp. in means or apparatus for the purpose of folding lace or other fabric, and also for cutting the same into lengths adapted to be used in the manufacture of bonnet and cap fronts, and for other purposes of millinery.
2180. C. W. Siemens, John-street, Adelphi—Imp. in electric telegraphs. (Partly a com.)
2182. G. Uhlhorn, Grevenbroich, near Cologne, Prussia—Imp. in applying motive power to give motion to machinery.
2184. F. J. Money, Thaxted, Essex—Imp. in the construction and adaptation of sewers.
Dated 1*st October*, 1858.
5185. W. Blake, 16, Harley street—An improved portable fire-escape.
2186. J. T. P. Newbon and T. Smith, 62, Fenchurch-street, and J. Brown, 37, Tollit-street, Mile End—An improved method of lifting and lowering ships' anchors.
2187. M. Hipp, Berne, Switzerland—Imp. in electric telegraphs.
2188. J. W. Wilkins, Temple-chambers, Fleet-street, and J. B. Dunn, Great Winchester-street—Imp. in constructing electric telegraph cables.
2189. Sir E. Belcher, 40, Charing-cross—Imp. in the manufacture of telegraphic cables.
2191. H. Bradbury, Whitefriars—Imp. in producing printing surfaces from engraved plates.
Dated 2*nd October*, 1858.
2192. J. Rogers, 9, Queen-square, Bartholomew-close—Imp. in submarine electric telegraph cables.
2193. L. D. Owen, 192, Tottenham-court-road—Imp. in ploughs for digging up potatoes, and for other purposes. (A com.)
2194. W. Brierley, senr., Cleckheaton, Yorkshire—Imp. in looms for weaving carpets and other fabrics.
2195. H. Monier, 2, Francis-street, Gelden-square—A new gas burner.
2196. B. Samuelson, Banbury—Imp. in the wheels of carts and other carriages to be used on common roads.
2197. H. G. Collins, Paternoster-row—Imp. in the production of blocks or surfaces to be used in printing.
2198. J. C. Holman, London-street, and E. W. Holman, Grafton-street, Fitzroy square—An improved pianoforte action.
2199. A. V. Newton, 66, Chancery-lane—An improved governor for marine and other steam engines. (A com.)
2200. S. Stimpson, Lower-road, Islington—An improved construction of fagot or fire lighter.
Dated 4*th October*, 1858.
2201. R. Dolby and J. Gates, Liverpool—An improved process of transfer printing, and ornamenting on glass and other transparent substances.
2202. L. A. Normandy, jun., 67, Judd street—An improved apparatus for the prevention of boilers exploding from a deficiency of water. (A com.)
2203. L. A. Normandy, jun., 67, Judd-street—Imp. in the manufacture of sulphate of copper. (A com.)
2204. M. Van Peteghem, Ghent, Belgium—Imp. in looms for weaving figured fabrics. (A com.)
2205. F. Trevithick, Penzance, Cornwall—Imp. in applying sails and keels to boats and vessels.
Dated 5*th October*, 1858.
2206. J. Mills, Manchester—Certain imp. in machinery or apparatus for roving, slubbing, or spinning cotton and other fibrous materials.
2207. A. Bessemer, Upper Holloway—Imp. in the manufacture of iron and steel, and in apparatuses to be employed therein.
2208. Major C. E. Oldershaw, R.A., Aldershot—An improved method of constructing electric telegraph cables.

2209. W. Menelaus, Dowlais Iron Works, Glamorganshire—Imp. in machinery for straightening rails and wrought-iron bars.

2210. M. Henry, 84, Fleet-street—Imp. in the means of, or arrangements for, working steam expansively. (A com.)

2211. J. H. Brown, Abbey Mills, Romsey, Hants—Imp. in the manufacture of projectiles.

2212. G. Hamilton, St. Martin's-le Grand, and W. Nash, Poplar—Imp. in locks.

2213. J. H. Brown, Abbey Mills, Romsey, Hants—Imp. in the manufacture of cartridges.

2214. J. Milnes, Sutton Mill, Cross Hills, near Leeds, Yorkshire—Imp. in weaving fabrics where cross weaving is employed.

2215. G. Lovett, East street, Manchester-square—Imp. in portable apparatus for administering hot air, vapour, and shower baths.

2216. M. Jacoby and F. R. Ensor, Nottingham—Imp. in the manufacture of bobbin-net or twist lace, and other fabrics made in twist lace machines.

Dated 6th October, 1858.

2217. J. Luis, 1B, Welbeck-street, Cavendish-square—A new method of joining sheet-iron, cast-iron, gutta-percha, and other tubes, by means of muffles. (A com.)

2218. G. Heppell, Newcastle-on-Tyne—Imp. in the construction of boilers, furnaces, and flues.

2219. G. Collier, Halifax—Imp. in winding machines.

2220. M. Harnett, Moreton-street, Pimlico—Imp. in preventing incrustation in steam-boilers. (A com.)

2221. C. Hill, Great Western Railway, Chippenham Station—Imp. in omnibuses and in apparatus for upholding the windows of omnibuses and other carriages.

222. J. Ridsdale, Stoke Newington—An improved reservoir or fountain pen.

2223. W. Malam, Clapham-road, Surrey—Imp. in apparatuses for the manufacture of gas.

2224. D. Scattergood and R. W. Smith, Nottingham—Imp. in machinery for the manufacture of looped fabrics.

2225. C. Baylis, Poultry, London—An improved mode of constructing and arranging underground chambers in populous cities or towns, for the reception of gas and water pipes, and telegraph wires.

Dated 7th October, 1858.

2226. D. Nicoll, 114, Regent-street—Imp. in the manufacture of cloaks and other garments, and for their application to purposes to which they have not hitherto been applied.

2227. C. H. Thurnham, Dalston—Imp. in the construction and application of certain mechanical arrangements to be adapted to the wheels of locomotives, carriages, and other vehicles for facilitating their traction or draught.

2228. E. J. Seyd, and J. W. N. Brewer, City of London—An imp. in the preparation of paper to render writing thereon indelible.

2229. J. C. Nouveau, 2, Rue Sainte-Appoline, Paris—Imp. in stopping or stoppering bottles and other vessels containing non-gaseous liquids.

2230. D. Naylor, Stockport—Imp. in looms for weaving carpets and other fabrics, and in the methods of manufacturing the same.

2231. N. Fellows, jun., West Derby, Lancashire—Imp. in tea kettles and other like domestic vessels.

2232. F. Ransome, Ipswich—Imp. in preserving wood.

2233. E. R. Handcock, 57, Pall-mall, Westminster—Certain imp. in machinery applicable to engines to be worked by steam and other motive power.

Dated 8th October, 1858.

2234. J. Luis, 1B, Welbeck-street, Cavendish-square—A new cutting and stamping press. (A com.)

2235. J. Leetch, Margaret-street, Cavendish-square—An improved method of constructing fire-arms.

2237. T. Waller, Rose lane, Ratcliff—Imp. in stoves and fire places for the prevention of smoke and the better ventilation of apartments.

2238. J. Mitchell, H. Mitchell, and T. England, Bradford—Imp. in means, machinery, or apparatus employed in spinning wool, mohair, alpaca, silk, and other fibrous substances.

2239. R. Searle, Woodford Wells, Essex—Imp. in insulating and preserving and laying submarine and other telegraphic wires or cables.

2240. A. Nicholls, Manchester, and T. Walker, Birmingham—An improved spring-hook, catch, or fastening.

2241. W. A. Munn, Throwley-house, near Feversham, Kent—Imp. in horse-hoes.

2242. T. Roberts and J. Dale, Manchester—An improved process for obtaining salts of soda and other alkalies.

2243. C. W. Lancaster, New Bond-street—A metal or metallic alloy especially adapted to the manufacture of fire arms and ordnance.

2244. A. Felton, 184, Brick-lane, Spitalfields—Imp. in instruments used for inserting and fixing metal eyelets.

2245. J. T. Smith, Gray's-inn—Imp. in electric cables.

2246. E. Birchley, Upper Severn-terrace, Worcester—An improved construction of cartridge.

2247. F. W. Gerhard, Tichborne-street, Haymarket—Imp. in the manufacture of aluminium and sodium.

Dated 9th October, 1858.

2248. A. E. Galliard, 2, Seymour-place, St. James Churchyard, Clerkenwell—Making self-supplying portable fountains to play water or water perfumed.

2250. J. Tatlock, Hookersbrook, near Chester—Imp. in electric telegraphs, and in telegraphic cables or conductors for the conducting of electricity in submarine and underground telegraphs.

2261. L. Hope, Bishopsgate Churchyard—Imp. in electric telegraph cables. (A com.)

2252. W. Crofts, Lenton-terrace, Park Side, Nottingham—Imp. in the manufacture of fabrics by bobbin-net or twist-lace machinery.

2253. J. B. Pascoe and J. R. Thomas, Chacewater, Cornwall—Imp. in condensing and gassing smoke, which are applicable also to forcing and drawing water, propelling ships, and drawing and forcing air to be worked with animal, water, steam, or air power.

2254. J. Scrimshaw, 13, Johnson-street, Sheffield—Imp. in pumps.

Dated 11th October, 1858.

2255. A. Miller, Glasgow—Imp. in locomotive steam engines. (A com.)

2256. J. Holroyd, Leeds—An imp. in the knives used for shearing woollen cloths, and cloths made of wool and other materials.

2257. C. F. Vasserot, 45, Essex-street, Strand—Imp. in constructing reflectors. (A com.)

2259. J. Beattie, Lawn-place, South Lambeth—Imp. in locomotive and other steam engines.

2261. J. L. Hancock and F. L. Hancock, Pentonville—Imp. in implements for tilling, breaking up, or pulverising land, for sowing seeds, and for thinning out turnips and other crops.

2262. J. England, Charles-street, Fitzroy-square—Imp. in apparatus for cleaning the plates used in photography.

2263. J. Platt, Audlem, Chester—Imp. in locks.

2264. J. Nicholson, junr., Meadow-street Works, Sheffield—Imp. in machinery for cutting and winding strips or shreds of steel, silver, or other metal used for ladies' dresses, measuring tapes, and other purposes, in which the use of strips or shreds of metal are required.

2266. T. Riddell, Carocou-terrace, Old Ford, Bow—An improved arrangement for sustaining window sashes and sliding panels.

2267. M. Stow, Leeds—Preventing or securing the detection of alterations or erasures in bankers' cheques and other similar instruments, and the crossings thereof.

2268. W. E. Newton, 66, Chancery-lane—Improved apparatus for facilitating submarine explorations. (A com.)

Dated 12th October, 1858.

2272. W. Johnston and W. Ross, Glasgow—Imp. in water-closets and taps or valves.

2274. Capt. G. Beadon, R.N., Bathpool, Somerset—Imp. in the construction of ships, boats, rafts, and vessels for passing through water, or through the atmosphere, or partly through the water and partly through the atmosphere.

2276. H. W. Cuthbertson and G. Cuthbertson, Dundas-street, Monkwearmouth, Sunderland—Imp. in lever purchases for ships, windlasses, pumps, and other similar purposes.

WEEKLY LIST OF PATENTS SEALED.

[*From Gazette, Oct.* 26, 1858.]

October 26th.

917. W. Jones.
920. J. Seaman.
921. W. Foster.
922. E. E. Lee.
928. C. F. Vasserot.
932. B. Drukker.
938. D. E. Hughes.
943. B. Martin and C. J. Light.
949. A. Winkler.
954. A. M. Perkins.
955. C. Lawrence.
957. W. Smith.
958. W. Smith.
968. G. H. Ellis.
975. R. Wardell.
981. J. A. Hartmann.
985. J. Taylor.
995. W. Ross.
1002. D. E. Hughes.
1023. J. M. Duvard.
1044. J. M. E. Masson.
1050. G. H. Creswell.
1101. H. Curzon, jun.
1130. J. C. Brant.
1169. G. Alton and J. Fernie.
1190. J. Schofield and G. Harling.
1295. A. Rigg, sen., and A. Rigg, jun.
1547. J. Broadley.
1632. J. Chadwick.
1816. W. Spence.
1834. G. Houghton.
1861. C. O'Neill.
1898. W. Clay and E. L. Benzon.
1906. C. De Jongh.
1914. A. Boyle.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

[*From Gazette, Oct.* 22, 1858.]

October 18th.

2342. W. Tatham.
2343. W. A. Gilbee.
2372. W. Shears.
2414. W. Hartley.

October 19th.

2353. N. S. Dodge.
2377. J. Rives.

October 20th.

2392. T. B. Sharp & R. Furnival.
2484. T. Thomas.

[*From Gazette, Oct.* 26, 1858.]

October 21st.

2375. J. Smith.

October 22nd.

2399. S. O'Regan.

October 23rd.

2385. E. H. Rascol.
2404. J. Hands.
2410. J. Whitworth.